

## Abstract

Functional membranes with functional membranes are known from nature, which, as a result of the overall structural and material arrangement thereof permit gas exchange and purification processes. Conventional technical membranes do not have either the functionality or the flexibility. The invention relates to an economical, flexible, breathable polymer film, modified in the region of the pores opening out in a funnel shape at the surface thereof, with a nanoscale particle system and which is particularly suitable for packaging purposes. The modification comprises at least one composite layer construction made from a binding agent layer of chemically inert inorganic nanoparticles and a lining layer of hydrophilic non-toxic metal oxide particles which are photocatalytically active under short wave light radiation and which have an anti-bacterial and self-cleaning effect. The efficacy thereof is dependent upon the selection of opening angle of the funnel-shapes opening of the pores. Various layer adjuncts are possible for increasing the functionality. Production occurs with a polymer film provided on both sides with funnel-shaped capillary pores by means of high-energetic ion radiation and single or double sided etching, by means of an economical surface treatment carried out at ambient conditions in a sol-gel system with colloidal nanoparticle dispersions, in particular based on ceramics.